

line 55), a liquid crystal display (LCD) comprising: a first substrate, 900, comprising a first surface; a second substrate, 800, comprising a second surface, the second surface being in parallel with and opposite to the first surface of the first substrate, and a pixel area being defined on the second surface; a second common electrode, 500 (Applicant's first electrode), positioned on the first surface of the first substrate; a first common electrode, 410 (Applicant's second electrode), disposed above the pixel region of the second substrate; the second electrode having side opening portions, 416 (Applicant's first slit) elongated along a first direction; an isolation layer, 812, disposed on the surface of the second substrate to cover the second electrode; a pixel electrode, 300 (Applicant's third electrode), disposed on the isolation layer and within the pixel region, opening portions, 304 (Applicant's second slit), being defined on the third electrode and along the first direction, the first and second slits being interlaced (per Figures 9 and 10); and a plurality of anisotropic liquid crystal molecules with negative dielectric constant (Abstract) positioned between the first electrode and the third electrode, the longitudinal axis of the liquid crystal molecules being positioned along a second direction horizontally (Figure 3 and col.21, lines 42-45), and a first angle being formed between the first direction and the second direction; wherein a biased electric field is formed as a voltage is applied between the first electrode and the second electrode, such that (a) a first horizontal biased electric field is formed in the neighborhood of the second slit (Figure 4), the

first horizontal biased electric field is perpendicular to the first direction, and the liquid crystal molecules are rotated to make the longitudinal axis of the liquid crystal molecules in the neighborhood of the second slit being in parallel to the first direction, (b) the longitudinal axis of the liquid crystal molecules in the neighborhood of the first electrode maintain along the second direction because no horizontal biased electric field is formed near the first electrode, and (c) the liquid crystal molecules between the first electrode and the second slit of the third electrode gradually rotate from the second direction to the first direction.

15 As to claim 2, Matsuyama discloses the liquid crystal display of claim 1, further comprising a first polarizer, 910, positioned above the first substrate, and a second polarizer, 810, positioned below the second substrate (col.14, lines 58-65 and col.21, lines 42-45).

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As to claim 5, the recitation of: wherein the biased electric field formed between the second electrode and the third electrode is used to accelerate the rotation of the liquid crystal molecules so as to reduce a driving voltage of the liquid crystal display, is an intended use and/or performance recitation in a device claim that is considered inherently met by the structure of Matsuyama.

30 As to claim 6, the recitation of: wherein the isolation layer is used to isolate the second electrode from the third electrode and avoid a short circuit

between the second electrode and the third electrode, is an intended use and/or performance recitation in a device claim that is considered inherently met by the structure of Matsuyama.

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Response:

The Applicant wants to point out that the arrangement of the first electrode (the upper common electrode), the second electrode (the pixel electrode), and the third electrode (the lower common electrode) in the present application is absolutely different from the second common electrode 500, the first common electrode 410, and the pixel electrode 300 disclosed in Matsuyama's invention. In the present application, the first electrode is positioned on the bottom surface of the top substrate, the pixel electrode is positioned on the top surface of the bottom substrate, and the third electrode is positioned on the pixel electrode and is isolated from the pixel electrode by an isolation layer. In Matsuyama's invention, the second common electrode is positioned on the bottom surface of the top substrate, the first common electrode is positioned on the top surface of the bottom substrate, and the pixel electrode is positioned on the first common electrode and is isolated from the first common electrode by an isolation layer.

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Therefore, the electric field, as shown in Fig.5, resulting from the electrode arrangements in the present application is absolutely different from the electric field, as shown in Fig.4, resulting from the electrode arrangements according to Matsuyama's invention. As disclosed in the present application, all of the electric fields start from the pixel electrode, and point to the upper common electrode and the lower common electrode, making the equipotential lines in a

wave. According to Matsuyama's invention, the electric fields start from the pixel electrode, points to the second common electrode 500 upwardly and the first common electrode 400 downwardly, making the circular equipotential lines 5 surrounding the pixel electrode 300.

Furthermore, according to the arrangement of electrodes in the present application, the isolation layer 206 is not only used to isolate the lower common electrode 210 from the pixel electrode 208, but is also used to avoid short circuits between the pixel electrode 208 and the first electrode 104 (page 7, lines 32-34). In other words, the isolation layer of the present invention can prevent electrodes from short-circuiting, thus eliminating problems of bright spots on a LCD (page 8, line 37 to page 9, line 2). Matsuyama never teaches how to avoid such a phenomenon according to the electrode arrangements in his invention. Reconsideration of the rejection over claim 1 is hereby requested.

As claims 2, 5 and 6 are dependent upon claim 1, they should be allowed if claim 1 is allowed. Reconsideration of claims 2, 5 and 6 is therefore requested.

2. Claims 3 and 4 are rejected under 35 U.S.C. 103(a).
As to claims 3 and 4 Matsuyama discloses the liquid crystal display of claim 1 wherein the second electrode, 410, is a transparent common electrode (Applicant's pixel electrode) (col. 15, lines 14-17 and col. 21, lines 42-45) and wherein the third electrode, 300, is a 30 transparent pixel electrode (Applicant's lower common electrode).

However, Matsuyama does not explicitly disclose a

display wherein the second electrode, 410, is a pixel electrode and wherein the third electrode, 300, is a lower common electrode.

Sato teaches in his first embodiment (Figure 7 and 8) a TFT substrate that has the pixel electrode above the common electrode with a bottom gate TFT (col.8, lines 63-65) is functionally equivalent (col.12, lines 7-11) to his second embodiment (Figures 10 and 11) a TFT substrate that has the common electrode above the pixel electrode with a topgate TFT (col.11, lines 59-61). Furthermore, reversal of parts is considered an obvious expedient, MPEP 2144.04, VI, A.

Sato is evidence that ordinary workers in the art of liquid crystals would find the reason, suggestion, or motivation to use a pixel electrode below a common electrode as an art recognized equivalent, MPEP 2144.06.

Therefore, it would have been obvious to one having ordinary skill in the art of liquid crystals at the time the invention was made to modify the LCD of Matsuyama with the art recognized equivalent of Sato.

Response:

As disclosed in Sato's invention, the term "functionally equivalent" merely indicates the current effect, not the field effect. As mentioned previously in the rejection over Claims 1, 2, 5 and 6, the electric field resulting from the electrode arrangements in the present application is absolutely different from the electric field resulting from the electrode arrangements according to Matsuyama's invention. That means, the liquid crystal display having the pixel

electrode above the common electrode can never produce the same electric field as the liquid crystal display having the common electrode above the pixel electrode. Therefore, the liquid crystal molecules on top of the 5 pixel electrodes are rotated due to absolutely different electric field distributions and absolutely different potential distributions, both in density and in direction. Finally, the rotation situations of the liquid crystal molecules are totally different and 10 result in different display performance. Reconsideration of the rejection over claims 3 and 4 is hereby requested.

3. Claims 7-11 are rejected under 35 U.S.C. 103(a).
15 As to claims 7, 8 and 11, Matsuyama discloses the liquid crystal display of claim 1.

Matsuyama does not explicitly disclose the use of a conductive protrusion.

Tani teaches as prior art the use of a conductive 20 columnar spacer (Applicant's protrusion) projected from the first surface of the first substrate, the protrusion being electrically connecting the counter electrode (Applicant's first electrode) with the auxiliary line so that the first electrode and the 25 auxiliary line are held at substantially equal voltage. Since the voltage is applied from a large number of locations to the counter electrode, the resistance between the auxiliary line and the counter electrode is so small that the voltage at the counter electrode 30 can be surely maintained at a predetermined value (Applicant's reduce signal delay). Also, since no stress is generated, irregular display may not occur,

thus improving the display quality. Further, the data bus lines and the scan bus lines may not be disconnected (col.1, lines 40-57).

Tani is evidence that ordinary workers in the art of liquid crystals would find the reason, suggestion, or motivation to add conductive protrusions to electrically connect a first electrode on a first substrate to conductive elements of like potential on the opposed substrate so the counter electrode can be surely maintained at a predetermined value, so, an irregular display may not occur, thus improving the display quality.

Therefore, it would have been obvious to one having ordinary skill in the art of liquid crystals at the time the invention was made to modify the LCD of Matsuyama with the conductive protrusions of Tani to electrically connect a first electrode on a first substrate to a third electrode of like potential on the opposed substrate so the counter electrode can be surely maintained at a predetermined value so, an irregular display may not occur, thus improving the display quality.

As to claim 9, Matsuyama discloses a display wherein the third electrode has a width, and the width is reduced by opening portions, 304 (Applicant's second slit), so as to increase an aperture ratio of the display.

As to claim 10, the recitations of: wherein static charges formed on the first electrode are released through the protrusion after the first electrode is connected to the third electrode, is a performance recitation in a device claim that is considered inherently met by the structure of Matsuyama in view

of Tani.

Response:

The conductive protrusions, shaped in a ball, in
5 Tani's invention are only disposed in the circumference
of the liquid crystal panel. When applying such
conductive protrusions to the liquid crystal panel,
the RC delay can never be effectively reduced because
the resistance value of the overall equivalent resistor
10 between the counter electrode and the transfer
electrode cannot be lowered. Therefore, the application
of the conductive protrusions according to Tani's
invention is limited to small sized liquid crystal
panels. The conductive protrusions according to the
15 present application are disposed between the upper
common electrode and the lower common electrode because
the upper common electrode is immediately above the
lower common electrode. Consequently, the conductive
protrusions in the present application can be disposed
20 within the liquid crystal panel extensively and evenly.
To apply the present application conductive protrusions
to the liquid crystal display panel extensively and
evenly will result in a much lower resistance value
of the overall equivalent resistor between the upper
25 common electrode and the lower common electrode, which
decreases the RC delay greatly to stabilize the potential
on the common electrodes. As a result, the conductive
protrusion in the present application can be applied
to large sized liquid crystal display panels, medium
30 sized liquid crystal display panels, and small sized
liquid crystal display panels. Reconsideration of the
rejection over claims 7-11 is hereby requested.

Sincerely yours,

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